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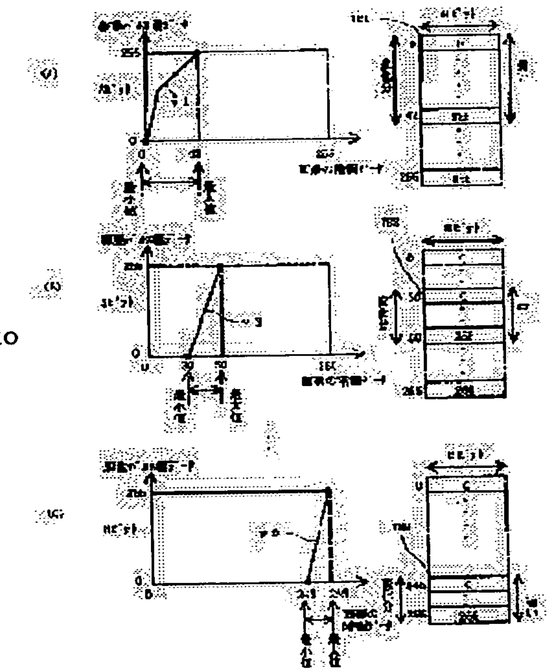
(54) ELECTROPHOTOGRAPHIC DEVICE, METHOD FOR IMAGE PROCESSING OF ELECTROPHOTOGRAPHIC PICTURE, AND RECORDING MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce capacity of a memory without deteriorating the image quality.

SOLUTION: On a screen table TB1 of a pixel 1, the drive pulse width data corresponding to gradation data '0' to '42' need to be stored because the data change, but the drive pulse width data corresponding to gradation data '43' to '255' are not required to be stored, because the data are constant at '255'. Therefore, the table TB1 is constituted of the drive pulse width data corresponding to the minimum gradation value '0' and maximum gradation value '42' of an area, where the output varies and the driving pulse width data corresponding to the gradation data '0' to '42', and accordingly, the data amount of the table TB1 is reduced.



CLAIMS

[Claim(s)]

[Claim 1] In the electrophotography equipment which expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image The translation table which has correspondence with gradation data and image reconstruction information for every pixel is referred to to the gradation data inputted. It is electrophotography equipment which has the half toning section which outputs said image reconstruction information, and is characterized by the translation table for said every pixel consisting of correspondences with said gradation data and image reconstruction information in some fields of the whole floor tone value of said gradation data.

[Claim 2] The translation table for said every pixel is electrophotography equipment according to claim 1 characterized by having the minimum gradation value and the maximum gradation value of the field where said image reconstruction information changes to change of said gradation data.

[Claim 3] The translation table for said every pixel is electrophotography equipment according to claim 2 characterized by having the image reconstruction information corresponding to the gradation data between said minimum gradation value and said maximum gradation value further.

[Claim 4] The translation table for said every pixel is electrophotography equipment according to claim 2 characterized by establishing the image reconstruction information corresponding to the gradation data between said minimum gradation value and said maximum gradation value in common by two or more pixels.

[Claim 5] In the image-processing approach of the electrophotography which expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image The translation table which has correspondence with gradation data and image reconstruction information for every pixel is referred to to the gradation data inputted. It is the image-processing approach of the electrophotography which has the half toning step which outputs said image reconstruction information, and is characterized by the translation table for said every pixel consisting of correspondences with said gradation data and image reconstruction information in some fields of the whole floor tone value of said gradation data.

[Claim 6] In the record medium which recorded the program which makes a computer perform the image-processing procedure of the electrophotography which expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image Said image-processing procedure refers to the translation table which has correspondence with gradation data and image reconstruction information for every pixel to the gradation data inputted. It is the record medium which has the half toning step which outputs said image reconstruction information, and recorded the image-processing program characterized by the translation table for said every pixel consisting of correspondences with said gradation data and image reconstruction information in some fields of the whole floor tone value of said gradation data.

[Claim 7] In the electrophotography equipment which expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image The translation table which has correspondence with gradation data and image reconstruction information for every pixel is referred to to the gradation data inputted. It has the half toning section which outputs said image reconstruction information. Said translation table It has the image reconstruction information corresponding to the intermittent gradation value and intermittent it of predetermined spacing. Said half toning section Electrophotography equipment characterized by searching for said image reconstruction information by the interpolation operation from said input

gradation data according to the image reconstruction information corresponding to the gradation value in said translation table.

[Claim 8] For said translation table, said half toning section is electrophotography equipment according to claim 7 characterized by searching for the image reconstruction information corresponding to [have the even-numbered gradation value, the 1st translation table which has the image reconstruction information corresponding to it, and the odd-numbered gradation value and the 2nd translation table which has the image reconstruction information corresponding to it, and] the gradation value of said adjoining both sides with reference to said 1st and 2nd translation tables.

[Claim 9] In the image-processing approach of the electrophotography which expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image The translation table which has correspondence with gradation data and image reconstruction information for every pixel is referred to to the gradation data inputted. It has the half toning step which outputs said image reconstruction information. Said translation table It has the image reconstruction information corresponding to the intermittent gradation value and intermittent it of predetermined spacing. Said half toning step The image-processing approach of the electrophotography characterized by searching for said image reconstruction information by the interpolation operation from said input gradation data according to the image reconstruction information corresponding to the gradation value of the both sides adjoined in said translation table.

[Claim 10] In the record medium which recorded the program which makes a computer perform the image-processing procedure of the electrophotography which expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image Said image-processing procedure refers to the translation table which has correspondence with gradation data and image reconstruction information for every pixel to the gradation data inputted. It has the half toning step which outputs said image reconstruction information. Said translation table It has the image reconstruction information corresponding to the intermittent gradation value and intermittent it of predetermined spacing. Said half toning step The record medium which recorded the image-processing program characterized by searching for said image reconstruction information by the interpolation operation from said input gradation data according to the image reconstruction information corresponding to the gradation value of the both sides adjoined in said translation table.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] In the electrophotography equipment which expresses gradation according to the halftone dot especially formed in electrophotography equipment and the image-processing approach of electrophotography, and a list from two or more dots about a record medium, in case this invention performs half toning, it relates to a record medium at the electrophotography equipment which enabled it to make small the amount of data of the gamma (gamma) table referred to and the image-processing approach of electrophotography, and a list.
[0002]
[Description of the Prior Art] Drawing 1 shows an example of the electrophotography system which reproduces a color picture using the toner of cyanogen (C), MAZENDA (M), yellow (Y), and black (K).
[0003] In a personal computer (PC) 1, an operator generates alphabetic data and graphic data using the application programs 11 (for example, a word processor, a graphic form tool, etc.) installed beforehand. The data generated by the application program 11 are supplied to the driver 12 for printer 2 beforehand installed in the personal computer 1. A driver 12 changes the supplied data into the image data which consists of gradation data of RGB (8 bit x3=24 bit) for every pixel. This image data is supplied to a printer 2 through a cable 3. The printer 2 consists of a controller 21 and an engine 22, and reproduces a color picture based on the supplied image data.
[0004] The controller 21 consists of a color transducer 31, the half toning section 32, and the Pulse-Density-Modulation (PWM (Pulse Width Modulation)) section 33. The color transducer 31 changes the gradation data of RGB for every supplied pixel into the gradation data D1 of CMYK which has RGB and a complementary color relation. The gradation data D1 of CMYK consist of 8 bits at a time, respectively, and have 256 gradation at the maximum. The gradation data D1 of CMYK outputted from the color transducer 31 are supplied to the half toning section 32.
[0005] Drawing 2 shows the example of a configuration of the half toning section 32. As shown in drawing 2 , the half toning section 32 consists of page memory 51, the screen treatment section 52, and screen table memory 53. The gradation data D1 of CMYK supplied from the color transducer 31 are stored in the page memory 51. The screen table (gamma table) is beforehand stored in the screen table memory 53. This screen table has correspondence with gradation data and the driving pulse width-of-face data of the laser which is image reconstruction information for every pixel.
[0006] The screen treatment section 52 reads the gradation data D1 for every pixel stored in the page memory 51, and chooses the screen table corresponding to the read pixel. With reference to the selected screen table, the screen treatment section 52 reads the driving pulse width-of-face data D2 corresponding to gradation data, and supplies the read driving pulse width-of-face data D2 to the Pulse-Density-Modulation section 33. Based on the supplied driving pulse width-of-face data D2, the pulse-width-modulation section 33 generates the pulse width modulating signal D3 for driving the laser diode 42 in an engine 22 (LD), and supplies the generated pulse width modulating signal D3 to an engine 22.
[0007] The engine 22 consists of the laser driver 41, a laser diode (LD) 42, a photoconductor drum (not shown), an imprint drum (not shown), etc. A laser driver 41 drives the laser diode 42 for image drawing based on the supplied Pulse-Density-Modulation signal D3. The laser beam which emitted light with the laser diode 42 is irradiated by the predetermined field of the photoconductor drum which is not illustrated, and forms the latent image which has predetermined surface potential on a

photoconductor drum. The electrified toner adheres to the latent image formed on the photoconductor drum, and a toner is imprinted through the imprint drum which is not illustrated at a print sheet. Thereby, a color picture is reproduced.
[0008] Next, the screen which constitutes the image reproduced with an engine 22 is explained with reference to drawing 3 . Drawing 3 shows the screen (or cel) 61 which consists of pixels of 3x3 (vertical x width) as an example. Based on the Pulse-Density-Modulation signal D3, the dot which is the field (shadow area in drawing) where it adhered to the toner is formed in the predetermined field in each pixel of a pixel 1 thru/or a pixel 9. A halftone dot 62 is formed of two or more dots, and the gradation of halftone (halftone) is expressed by the magnitude of this halftone dot. Thus, the technique of reproducing the middle gradation of a shade image with the magnitude of a halftone dot is called a dither method (Dither Method), and is used widely. In the screen 61, the dot 1 thru/or the dot 5 are formed in the pixel 1 thru/or the pixel 5, respectively, and the halftone dot 62 is formed of these dot 1 thru/or 5.
[0009] Next, the concentration (gradation) expressed on the above-mentioned screen 61 is explained with reference to drawing 4 . As shown in drawing 4 (A), the screen 61 consists of 9 pixels and can express the concentration of 0 (0/9) thru/or 1 (9/9). Here, concentration 0 is made into the least concentration and let concentration 1 be the maximum concentration. The concentration expressed on a screen 61 is based on the Pulse-Density-Modulation signal D3 generated in the Pulse-Density-Modulation section 33.
[0010] For example, when making concentration 1/9 express on a screen 61, the Pulse-Density-Modulation section 33 outputs a Pulse-Density-Modulation signal as shown in drawing 4 (B) to the scan line of three lines which has three pixels, respectively. In this case, a pulse-width-modulation signal becomes H (High) level in the location of a pixel 1. When making concentration 0/9 thru/or 1/9 express, the Pulse-Density-Modulation section 33 changes the pulse width of a Pulse-Density-Modulation signal within a pixel 1 corresponding to concentration. When making concentration 2/9 express on a screen 61, the Pulse-Density-Modulation section 33 outputs a Pulse-Density-Modulation signal as shown in drawing 4 (C) to the scan line of three lines. That is, a pulse-width-modulation signal becomes H level in the location of a pixel 1 and a pixel 2. When making concentration 4/9 express on a screen 61, the Pulse-Density-Modulation section 33 outputs a Pulse-Density-Modulation signal as shown in drawing 4 (D) to the scan line of three lines. That is, a pulse-width-modulation signal becomes H level in the location of the 1 pixel pixel [2 pixel] 3 and a pixel 4. When making concentration other than the above express, the Pulse-Density-Modulation section 33 outputs the Pulse-Density-Modulation signal of the pulse width corresponding to concentration (a maximum of 256 gradation) to a predetermined scan line similarly.
[0011] As mentioned above, it can express up to 256 gradation per pixel by changing the pulse width of a Pulse-Density-Modulation signal to each pixel on a screen 61. However, in an engine 22, by the reasons of the particle size of a toner etc., since the class of area of the dot formed per pixel is about 20 in fact, 256 gradation expressions of it cannot be carried out. However, if the number of gradation which can be expressed on a screen 61 is made into 20 gradation per pixel, it will serve as 180 (20x9) gradation by 9 pixels.
[0012] Next, processing actuation of a controller 21 is concretely explained with reference to drawing 5 . First, processing of the gradation data of a pixel 1 is explained below. The screen treatment section 52 reads the gradation data "42" of the pixel 1 stored in the page memory 51 (drawing 5 (A)), and chooses the screen table (gamma table) corresponding to a pixel 1 (drawing 5 (B)). With reference to the selected screen table, the screen treatment section 52 reads the driving pulse width-of-face

data "255" corresponding to gradation data "42" (drawing 5 (C)), and supplies the read driving pulse width-of-face data "255" to the Pulse-Density-Modulation section 33. The pulse-width-modulation section 33 supplies the pulse width modulating signal D3 which generated and (drawing 5 (D)) generated the pulse width modulating signal D3 based on the supplied driving pulse width-of-face data "255" to the laser driver 41 in an engine 22.

[0013] In processing of the gradation data of a pixel 2, the screen treatment section 52 reads the gradation data "41" of the pixel 2 stored in the page memory 51 (drawing 5 (A)), and the screen table (gamma table) corresponding to a pixel 2 is chosen (drawing 5 (B)). With reference to the selected screen table, the screen treatment section 52 reads the driving pulse width-of-face data "120" corresponding to gradation data "41" (drawing 5 (C)), and supplies the read driving pulse width-of-face data "120" to the Pulse-Density-Modulation section 33. The pulse-width-modulation section 33 supplies the pulse width modulating signal D3 which generated and (drawing 5 (D)) generated the pulse width modulating signal D3 based on the supplied driving pulse width-of-face data "120" to the laser driver 41 in an engine 22.

[0014] Since the same processing as the above-mentioned pixel 1 and a pixel 2 is performed about processing of the gradation data of each pixel of a pixel 3 thru/or a pixel 9, explanation is omitted. However, in the example of drawing 5 , all the Pulse-Density-Modulation signals corresponding to each pixel of a pixel 3 thru/or a pixel 9 are 0.

[0015] Next, an example of the input-output behavioral characteristics of the screen table (gamma table) shown in drawing 5 (B) is shown in drawing 6 . Drawing 6 (A) shows an example of the input-output behavioral characteristics of the screen table concerning [drawing 6 (C)] a pixel 9 in an example of the input-output behavioral characteristics of the screen table concerning [drawing 6 (B)] a pixel 2 in an example of the input-output behavioral characteristics of the screen table about a pixel 1. An axis of abscissa expresses the gradation data (input) of a pixel, and the axis of ordinate expresses driving pulse width-of-face data (output).

[0016] As the input-output behavioral characteristics of the screen table corresponding to a pixel 1 are shown in drawing 6 (A), driving pulse width-of-face data have started rapidly up to 256 gradation in the field where the gradation data of a pixel are small. On the other hand, the input-output behavioral characteristics of the screen table corresponding to a pixel 2 have started gently to the gradation data of a pixel, as shown in drawing 6 (B). As the input-output behavioral characteristics of the screen table corresponding to a pixel 9 are shown in drawing 6 (C), driving pulse width-of-face data have started rapidly up to 256 gradation in the field where the gradation data of a pixel are large. And the pixel gradation data of an input have the gradation of 256, and the driving pulse width-of-face data of an output also consist of 8 bits, respectively, and they have the resolution of 256. consequently, the screen table memory 53 -- x (256 gradation x8 bit) -- the memory space for 9 pixels is needed.

[0017]

[Problem(s) to be Solved by the Invention] However, the size of a screen (cel) 61 has many pixels in fact, consequently the screen table memory 53 needed to store the data of the capacity for 1 pixel which consists of 256 gradation x8 bit only several pixel minutes, and the technical problem that the capacity of the screen table memory 53 became very large occurred.

[0018] Moreover, the screen table memory 53 consisted of high-speed SRAM (Static Random Access Memory), and usually had the technical problem that increase of this memory space caused the rise of cost.

[0019] Then, the purpose of this invention is to offer the electrophotography equipment which made capacity of screen table memory small, without degrading image

quality.
[0020]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, one side face of this invention constitutes the screen table (translation table) for every pixel from correspondence with the gradation data and image reconstruction information in some fields of the whole floor tone value of gradation data. In the half toning using a halftone dot, as for the translation table for every pixel, the image reconstruction information on an output may change only in some fields of a whole floor tone value. Then, this invention gives only the translation data about some of the fields to a translation table. Consequently, the number of data of a screen table can be reduced.
[0021] In the electrophotography equipment which this invention expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image in order to attain the above-mentioned purpose The translation table which has correspondence with gradation data and image reconstruction information for every pixel is referred to to the gradation data inputted. It has the half toning section which outputs said image reconstruction information, and the translation table for said every pixel is characterized by consisting of correspondences with said gradation data and image reconstruction information in some fields of the whole floor tone value of said gradation data.
[0022] According to above-mentioned this invention, capacity of screen table (translation table) memory can be made smaller, without degrading the image quality of a playback image.
[0023] In the image-processing approach of the electrophotography which this invention expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image in order to attain the above-mentioned purpose The translation table which has correspondence with gradation data and image reconstruction information for every pixel is referred to to the gradation data inputted. It has the half toning step which outputs said image reconstruction information, and the translation table for said every pixel is characterized by consisting of correspondences with said gradation data and image reconstruction information in some fields of the whole floor tone value of said gradation data.
[0024] In the record medium which recorded the program which makes a computer perform the image-processing procedure of the electrophotography which this invention expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image in order to attain the above-mentioned purpose Said image-processing procedure refers to the translation table which has correspondence with gradation data and image reconstruction information for every pixel to the gradation data inputted. It has the half toning step which outputs said image reconstruction information, and the translation table for said every pixel is characterized by consisting of correspondences with said gradation data and image reconstruction information in some fields of the whole floor tone value of said gradation data.
[0025] Another side face of this invention constitutes a translation table from a gradation value with discontinuous predetermined spacing, and image reconstruction information corresponding to it, and searches for the output image reconstruction information that carry out the interpolation operation of the image reconstruction information corresponding to a gradation value, and it corresponds, from the gradation data inputted. By carrying out like this, memory space of a translation table can be made smaller.
[0026] In the electrophotography equipment which this invention expresses gradation according to the halftone dot formed from two or more dots, and reproduces an image

in order to attain the above-mentioned purpose The translation table which has correspondence with gradation data and image reconstruction information for every pixel is referred to to the gradation data inputted. It has the half toning section which outputs said image reconstruction information. Said translation table It has the image reconstruction information corresponding to the intermittent gradation value and intermittent it of predetermined spacing, and said half toning section is characterized by searching for said image reconstruction information by the interpolation operation from said input gradation data according to the image reconstruction information corresponding to the gradation value in said translation table.
[0027]
[Embodiment of the Invention] Hereafter, with reference to a drawing, the example of a gestalt of operation of this invention is explained. However, the example of a gestalt of this operation does not limit the technical range of this invention.
[0028] Drawing 7 shows an example of the input-output behavioral characteristics of the screen table (gamma table) which is a translation table. The axis of abscissa expresses the driving pulse width-of-face data (output) whose axis of ordinate is image reconstruction information about the gradation data (input) of a pixel. The example of drawing 7 shows the gamma table (input-output behavioral characteristics) gamma 1 corresponding to nine pixels which constitute a screen 61 thru/or gamma 9. On the gamma table gamma 1, in the field where the gradation data of a pixel are small, driving pulse width-of-face data started rapidly, and have started comparatively gently to the maximum driving pulse width of face "255" after that. In the field where input gradation data after the driving pulse width-of-face data of an output amount to "255" of maximum are expensive, the conventional gamma table gamma 1 has memorized the driving pulse width-of-face data corresponding to the whole floor tone field of 0 of the gradation data of an input thru/or 255, although most outputs are maximum "255."
[0029] On the gamma tables gamma2 and gamma3, driving pulse width-of-face data have started comparatively gently to the gradation data of a pixel. For the conventional gamma tables gamma2 and gamma3, input gradation data are a low field or a high field, and most backward acting pulse width data are the minimum value "0". Or in spite of being maximum "255", the driving pulse width-of-face data corresponding to the whole floor tone field of 0 of input gradation data thru/or 255 are memorized.
[0030] In the gamma table gamma 9, driving pulse width-of-face data have started rapidly to maximum "255" in the field where the gradation data of a pixel are large. In the field where input gradation data are low, the conventional gamma table gamma 9 has memorized the driving pulse width-of-face data corresponding to the whole floor tone field of 0 of input gradation data thru/or 255, although most driving pulse width-of-face data serve as the minimum value "0."
[0031] As mentioned above, the driving pulse width-of-face data of an output change to 0 thru/or 255 only by a certain limited within the limits among the whole floor tones of input gradation data, and the driving pulse width-of-face data of the gamma table gamma 1 thru/or gamma 9 are the minimum value "0" or maximum "255" in the other range. That is, it sets to the gamma table gamma 1 thru/or gamma 9, and most driving pulse width-of-face data are the minimum value "0". Or in spite of being maximum "255", memorizing driving pulse width-of-face data to the whole floor tone field of input gradation data is connected with increasing the capacity of the screen table memory 53.
[0032] Since an output value is rapidly started in a field (gamma 1) with the concentration (gradation value) of a screen (cel) near zero, it enables it to adhere and change of gradation can recognize a toner clearly to human being's eyes certainly in the field (gamma2, gamma3) where concentration is comparatively low, the example of

the input-output behavioral characteristics of the screen table shown in drawing 7 has started the output value comparatively gently. And since change of gradation can hardly recognize to human being's eyes in the field (gamma 9) where concentration is high, the output value has been started rapidly. Thus, in the half toning using a screen table, it is required to prepare the gamma table of different input-output behavioral characteristics for every pixel, and a concentration change ideal for human being's eyes can be given by doing so.

[0033] Drawing 8 shows the screen table (translation table) and an example of input-output behavioral characteristics for every pixel which applied this invention. Drawing 8 (A) shows an example of the screen table TB 1 about a pixel 1, the screen table TB 2 concerning [drawing 8 (B)] a pixel 2 in an example of the input-output behavioral characteristics gamma 1, the screen table TB 9 concerning [drawing 8 (C)] a pixel 9 in an example of the input-output behavioral characteristics gamma 2, and its input-output behavioral characteristics gamma 9. The axis of abscissa of input-output behavioral characteristics expresses the driving pulse width-of-face data (output) whose axis of ordinate is image reconstruction information about the gradation data (input) of a pixel.

[0034] Although it is necessary on the screen table of a pixel 1 to memorize since gradation data "0" thru/or the driving pulse width-of-face data corresponding to "42" change as shown in drawing 8 (A) Since gradation data "43" thru/or the driving pulse width-of-face data corresponding to "255" are fixed at "255", it is not necessary to memorize all the driving pulse width-of-face data of the output corresponding to input gradation data in this field of "43" thru/or "255." Therefore, only the minimum gradation value "0" of the input gradation data of a field from which driving pulse width-of-face data change, the maximum gradation value "42" and gradation data "0" thru/or the driving pulse width-of-face data corresponding to "42" are memorized here. That is, only the part of the continuous line of drawing 8 (A) is memorized as a screen table TB 1.

[0035] As shown in drawing 8 (B), since gradation data "0" thru/or the driving pulse width-of-face data corresponding to "29" are fixed at "0", on the screen table of a pixel 2, it is not necessary to memorize all the driving pulse width-of-face data of the output corresponding to input gradation data in this field of "0" thru/or "29." Moreover, since gradation data "30" thru/or the driving pulse width-of-face data corresponding to "50" change, it is necessary to memorize but, and since gradation data "51" thru/or the driving pulse width-of-face data corresponding to "255" are fixed at "255", it is not necessary to memorize all the driving pulse width-of-face data of the output corresponding to input gradation data in this field of "51" thru/or "255." Therefore, only the minimum gradation value "30" of the field where an output changes, the maximum gradation value "50" and gradation data "30" thru/or the driving pulse width-of-face data corresponding to "50" are memorized here. That is, only the part of the continuous line of drawing 8 (B) is memorized as a screen table TB 2.

[0036] As shown in drawing 8 (C), since gradation data "0" thru/or the driving pulse width-of-face data corresponding to "244" are fixed at "0", on the screen table of a pixel 9, it is not necessary to memorize the whole of this field but, and since gradation data "245" thru/or the driving pulse width-of-face data corresponding to "255" change, it is necessary to memorize them. Therefore, only the minimum gradation value "245" of the field where an output changes, the maximum gradation value "255" and gradation data "245" thru/or the driving pulse width-of-face data corresponding to "255" are memorized here. That is, only the part of the continuous line of drawing 8 (C) is memorized as a screen table TB 9.

[0037] As described above, it becomes possible to make capacity of the screen table

memory 53 smaller by reducing the driving pulse width-of-face data made to memorize. Moreover, the field (a changed part) where a screen table changes becomes short, when the gamma table gamma 9 starts rapidly as are shown in drawing 8 (A), and it becomes long and is shown in drawing 8 (C), when the gamma table gamma 1 starts gently. every [namely,] pixel -- the minimum -- required table length should just be secured as memory space.

[0038] The configuration of the gestalt of 1 operation of the electrophotography system which applied this invention is the same as drawing 1 and drawing 2 . The gradation data of supplied CMYK are stored in the page memory 51 also in the gestalt of this operation. Similarly, the screen table (gamma table) showing the correspondence relation between gradation data and driving pulse width-of-face data (image reconstruction information) for every pixel is beforehand stored in the screen table memory 53. However, the screen table memory 53 is made to memorize the minimum gradation value in the field in which driving pulse width-of-face data change, the maximum gradation value, and the image reconstruction information on the field between them (driving pulse width-of-face data) with the gestalt of this operation. Thereby, the amount of data of a screen table can be reduced as above-mentioned.

[0039] Drawing 9 is a flow chart for explaining processing actuation of a controller 21. Drawing 10 is for explaining processing of a controller 21 concretely. As for drawing 10 (B), drawing 10 (C) shows [drawing 10 (A)] an example of the data D3 with which, as for drawing 10 (D), the pulse-width-modulation section 33 outputs an example of the data D2 with which the screen treatment section 52 outputs an example of the screen table 53 for an example of the gradation data D1 stored in the page memory 51.

[0040] Next, processing actuation of a controller 21 is explained with reference to the flow chart and drawing 10 of drawing 9 . First, in step S1, a personal computer 1 supplies the gradation data of RGB to the color transducer 31 through a cable 3.

[0041] The color transducer 31 changes the gradation data of supplied RGB into the gradation data of CMYK, and makes the page memory 51 memorize the gradation data of CMYK in step S2.

[0042] In step S3, the screen treatment section 52 reads the gradation data for every pixel memorized by the page memory 51 (refer to drawing 10 (A)), and chooses the screen table (gamma table) corresponding to the read pixel in step S4 (refer to drawing 10 (B)).

[0043] In step S5, the screen treatment section 52 compares the gradation data of the read pixel with the minimum gradation value of the selected screen table.

[0044] In step S6, when judged with the gradation data of a pixel being below the minimum gradation value, it progresses to step S7 and the screen treatment section 52 generates "0" as driving pulse width-of-face data (see the pixel 3 thru/or pixel 9 of drawing 10 (C)). In step S6, when judged with the gradation data of a pixel not being below the minimum gradation value (larger than the minimum gradation value), it progresses to step S8.

[0045] In step S8, the screen treatment section 52 compares the gradation data and the maximum gradation value of a pixel. And when judged with the gradation data of a pixel being beyond the maximum gradation value, it progresses to step S9 and the screen treatment section 52 generates "255" as driving pulse width-of-face data (see the pixel 1 of drawing 10 (C)). In step S8, when judged with the gradation data of a pixel not being beyond the maximum gradation value (smaller than the maximum gradation value), it progresses to step S10 and the screen treatment section 52 reads corresponding driving pulse width-of-face data with reference to the screen table 53 (see the pixel 2 of drawing 10 (C)).

[0046] Setting to step S11, the screen treatment section 52 supplies the driving pulse width-of-face data generated or read to the Pulse-Density-Modulation section 33.

The pulse-width-modulation section 33 supplies the pulse width modulating signal D3 which generated and (refer to drawing 10 (D)) generated the pulse width modulating signal D3 based on the supplied driving pulse width-of-face data to a laser driver 41, and processing actuation is ended.
[0047] Drawing 11 shows the configuration of the gestalt of operation of the 2nd of the screen table memory 53. In the example of drawing 11 , the screen table memory 53 has the change table TB 11 common to each pixel while memorizing the minimum gradation value and the maximum gradation value of the field where the output of each pixel of a pixel 1 thru/or a pixel 9 changes. This change table TB 11 is what share-ized the data of a field from which driving pulse width-of-face data (image reconstruction information) change to gradation data, and memorized them, and is made into a fixed length to a pixel 1 thru/or a pixel 9. Moreover, driving pulse width-of-face data consist of 8 bits. With the 1st configuration of the gestalt of operation, although the screen table was prepared for every pixel, the 2nd configuration of the gestalt of operation enables it to make capacity of the screen table memory 53 still smaller by preparing a common change table to two or more pixels. However, in this example, in order to give **** shown in drawing 7 , and different input-output behavioral characteristics for every pixel, a predetermined conversion operation is needed based on the common change table TB 11 and the common minimum gradation value for every pixel, and the maximum gradation value.
[0048] Drawing 12 shows the configuration of the gestalt of operation of the 3rd of the screen table memory 53. The example of drawing 12 omits the change table TB 11 common from the 2nd configuration of the gestalt of operation shown in drawing 11 , and has composition which consists only of the minimum gradation value and the maximum gradation value of an output change field in each pixel. This becomes possible to make capacity of the screen table memory 53 still smaller. The changed data of gradation data and the driving pulse width-of-face data corresponding to it are called for by linear interpolation approximation from the minimum gradation value and the maximum gradation value, and the driving pulse width-of-face data corresponding to them, as shown in drawing 13 . According to this operation, the screen table which has the input-output behavioral characteristics of a different inclination at least for every pixel is realizable.
[0049] Drawing 14 shows the configuration of the gestalt of operation of the 4th of the screen table memory 53. In order that the example of drawing 14 may reduce the driving pulse width-of-face data made to memorize, "X0" is made to correspond to the gradation data "0" (or the minimum gradation value) of a pixel. "X7" is made to correspond to the gradation data "255" (or the maximum gradation value) of a pixel, between them is equally divided into seven at the predetermined spacing, and it is made to make eight discontinuous (for it to be intermittent) gradation data and the driving pulse width-of-face data corresponding to it memorize. It asks for the driving pulse width-of-face data corresponding to input gradation data other than eight gradation data memorized by interpolation approximation.
[0050] That is, the gradation value X0 of the both sides which adjoin input gradation data the driving pulse width-of-face data Y0 corresponding to X7 thru/or Y7 are read, and it asks for the driving pulse width-of-face data corresponding to input gradation data by the interpolation operation from the two driving pulse width-of-face data. Although the driving pulse width-of-face data corresponding to the even-numbered gradation value and the driving pulse width-of-face data corresponding to the odd-numbered gradation value are needed at this time The screen treatment section 52 so that the even-numbered data and the odd-numbered data can be read to coincidence in the example of drawing 14 The odd number table TB 21 which consists of driving pulse width-of-face data corresponding to the even-numbered gradation value, the

even number table TB 20 and the odd-numbered gradation value which consist of driving pulse width-of-face data corresponding to it, and it is formed. Moreover, the driving pulse width-of-face data Y0 in the even number odd number table [TB / TB and / 21] 20 thru/or Y7 consist of 8 bits, respectively.
[0051] Drawing 15 shows an example of the input-output behavioral characteristics of the screen table (the even number odd number table [TB / TB and / 21] 20) shown in drawing 14 . In the input-output behavioral characteristics of drawing 15 , it asks for them by interpolation approximation as data other than the data memorized were mentioned above. For example, according to linear interpolation, the driving pulse width-of-face data "Y23" corresponding to gradation data "X2" and the middle input gradation data "X23" of "X3" are calculated by the following (1) formula.
[0052]
$Y23=Y2+ \{(Y3-Y2) \times (X23-X2)\} /(X3-X2)$ --- (1)
The screen treatment section 52 can read required driving pulse width-of-face data "Y2" and required "Y3" from the even number odd number table [TB / TB and / 21] 20 to coincidence, respectively, when calculating the above-mentioned (1) formula. It becomes possible to shorten read-out time amount of memory and to shorten time amount of half toning by this. In addition, as for the linear interpolation approximation in drawing 15 , as for the field where the standup of the input-output behavioral characteristics of a screen table is more rapid, precision becomes good.
[0053] Moreover, since it becomes unnecessary for d then the gradation data X0 thru/or each value of X7 to make the gradation data X0 thru/or each spacing of X7 memorize, the capacity of the screen table memory 53 can be reduced further. For example, "X2" and "X3" are calculated by (following 2) and following (3) types.
[0054] $X2=INT(X23/d) xd$ -- (2)
$X3=X2+d$ --- (3)
Here, it means that INT omits and integer-izes below the a small number of point in a parenthesis.
[0055] Furthermore, since the division process of (1) and (2) types can perform the gradation data X0 thru/or each spacing of X7 only by shift actuation in the arithmetic circuit which calculates the exponentiation (X3-X2=2n), then binary data of 2, it becomes possible to shorten the operation time.
[0056] Drawing 16 is the block diagram showing the configuration of the gestalt of other operations of an electrophotography system. The electrophotography system of drawing 16 incorporates the color conversion function and half toning function by the side of the printer 2 of the electrophotography system shown in drawing 1 to the driver 92 in a personal computer 81, and is realized. A driver 92 is a computer program beforehand installed in a personal computer 81. Each function of an application program 91, the color transducer 112, the half toning section 113, the pulse-width-modulation section 121, a laser driver 131, and a laser diode 132 is the same as that of the application program 11 in the example of a gestalt of the above-mentioned implementation, the color transducer 31, the half toning section 32, the pulse-width-modulation section 33, a laser driver 41, and a laser diode 42.
[0057] Color transform processing and half toning are performed in the example of a system of drawing 16 by the driver 92 installed in a personal computer 81 side. In the example of a system of drawing 1 , although color transform processing and half toning were performed by the controller 21 in a printer 2, the example of a system of drawing 16 performs them by the personal computer 81 side. When low-pricing of a printer 82 is required, it is effective to lower the capacity of a controller 101 and to realize color transform processing and half toning by the driver program installed in a personal computer 81. When half toning is realized by the driver 92, the record medium with which the program which makes a computer perform the above-mentioned half toning

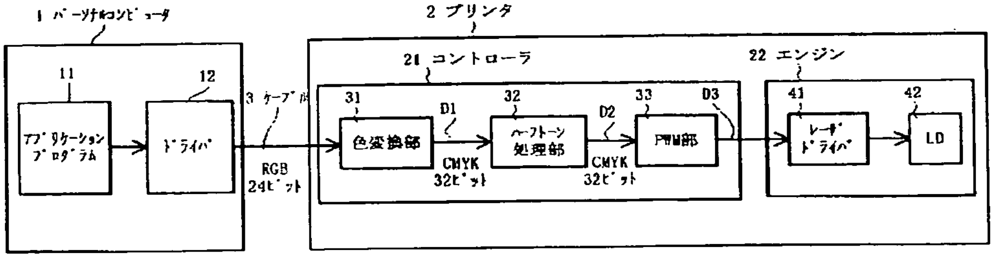
procedure was stored is built in a personal computer 81.
[0058] In addition, the transmission medium by networks, such as the Internet besides information record media, such as a magnetic disk and CD-ROM, and a digital satellite, is also contained in the record medium which provides a user with the computer program which performs the above-mentioned processing.
[0059] Moreover, in the gestalt of this operation, from a nearby value, it may ask for secondary approximation curves or a 3rd approximation curve, and the interpolation operation of the interpolation operation may be carried out without being limited to linear interpolation.
[0060]
[Effect of the Invention] Since it was made to lessen the amount of data of a screen table like the above according to this invention, it becomes possible to make capacity of screen table memory smaller. Therefore, it becomes possible to hold down the cost of screen table memory lower.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing an example of an electrophotography system.
[Drawing 2] It is drawing showing the example of a configuration of the half toning section 32 of drawing 1 .
[Drawing 3] It is drawing for explaining a screen 61.
[Drawing 4] It is drawing for explaining the relation between a screen 61 and a Pulse-Density-Modulation signal.
[Drawing 5] It is drawing for explaining the processing in a controller 21 concretely.
[Drawing 6] It is drawing showing an example of the input-output behavioral characteristics of the screen table of drawing 5 (B).
[Drawing 7] It is drawing showing an example of the input-output behavioral characteristics of a screen table.
[Drawing 8] It is drawing showing an example of the screen table which applied this invention, and its input-output behavioral characteristics.
[Drawing 9] It is a flow chart for explaining processing actuation of a controller 21.
[Drawing 10] It is drawing for explaining the processing in a controller 21 concretely.
[Drawing 11] It is drawing of the screen table memory 53 showing the 2nd configuration of the gestalt of operation.
[Drawing 12] It is drawing of the screen table memory 53 showing the 3rd configuration of the gestalt of operation.
[Drawing 13] It is drawing for explaining the technique for computing middle data.
[Drawing 14] It is drawing of the screen table memory 53 showing the 4th configuration of the gestalt of operation.
[Drawing 15] It is drawing for explaining the technique for computing middle data.
[Drawing 16] It is the block diagram showing the configuration of the gestalt of other operations of an electrophotography system.
[Description of Notations]
1 Personal Computer
2 Printer
21 Controller
22 Engine
31 Color Transducer
32 Half Toning Section
33 Pulse-Density-Modulation Section
41 Laser Driver
42 Laser Diode
51 Page Memory
52 Screen Treatment Section
53 Screen Table Memory (Translation Table)

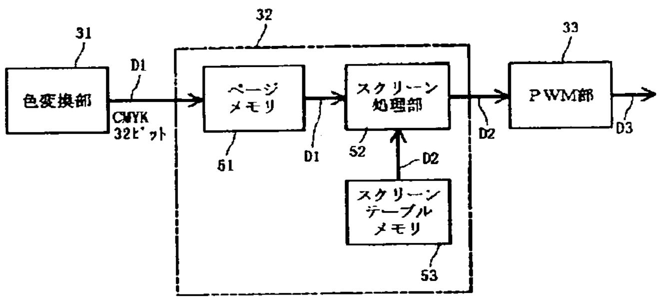
DRAWINGS

[Drawing 1]



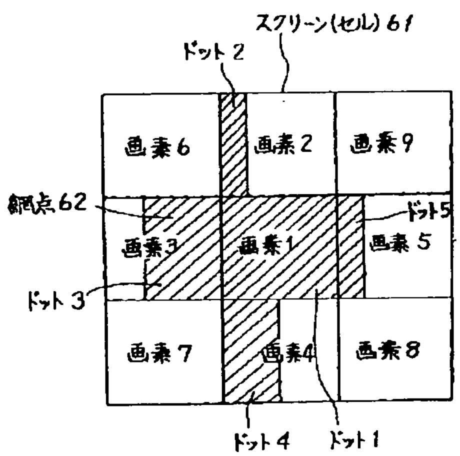
[Drawing 2]

ハーフトーン処理部　３２



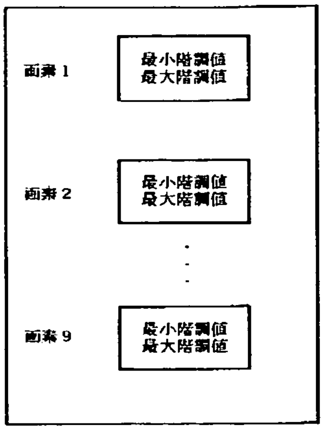
[Drawing 3]

スクリーン61(3×3画素)



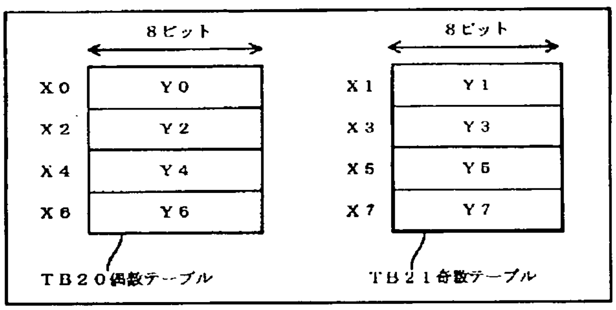
[Drawing 12]

スクリーンテーブルメモリ53



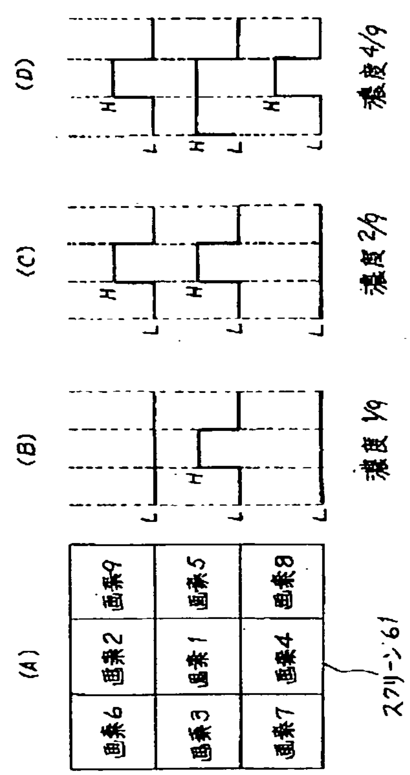
[Drawing 14]

スクリーンテーブルメモリ53

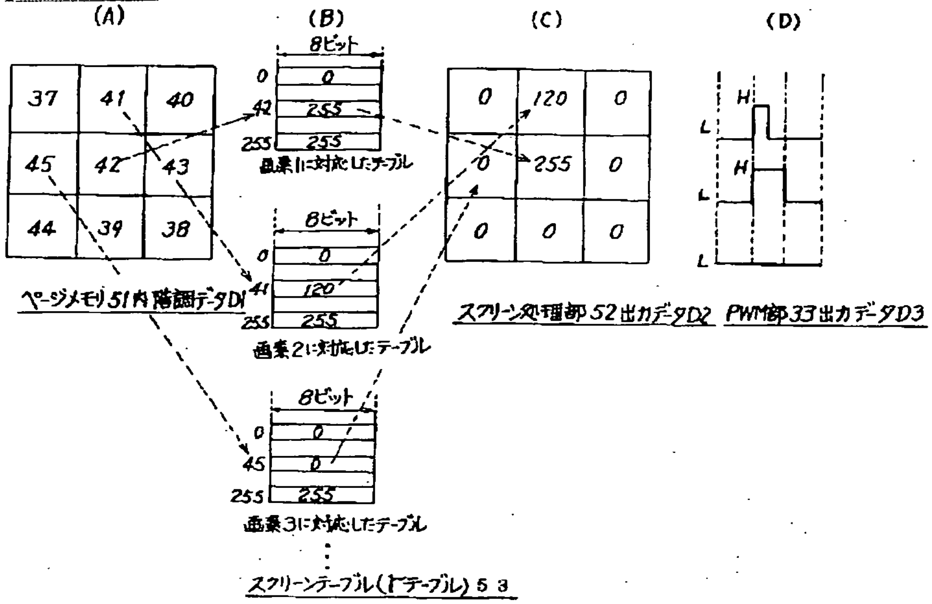


[Drawing 4]

パルス幅変調信号D3

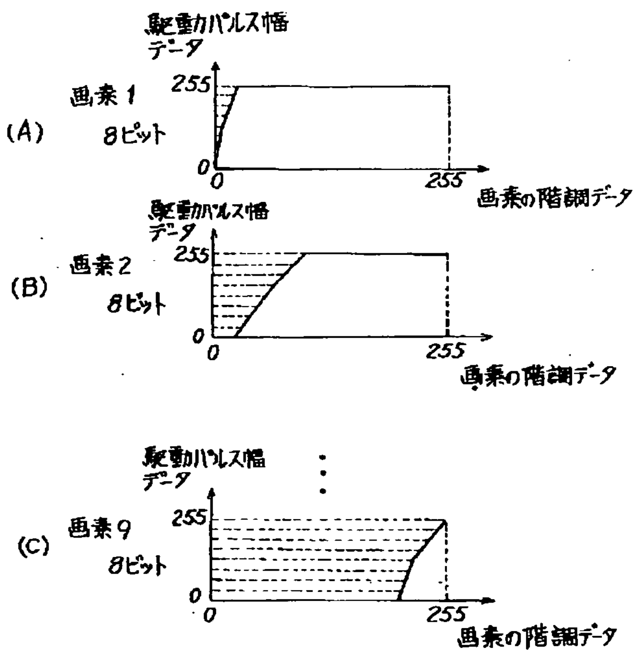


[Drawing 5]



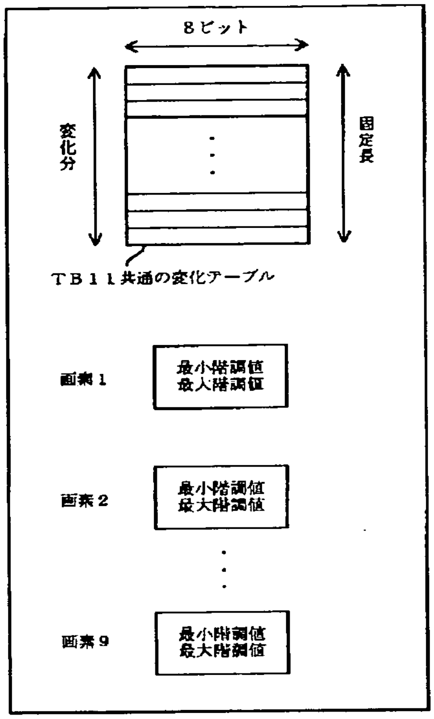
[Drawing 6]

スクリーンテーブル(γテーブル)の入出力特性



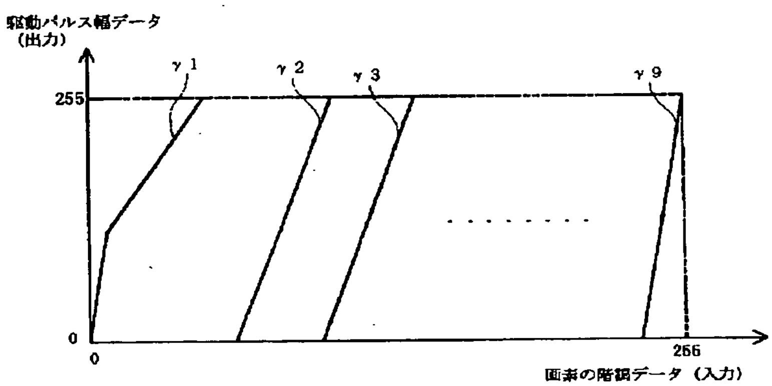
[Drawing 11]

スクリーンテーブルメモリ５３

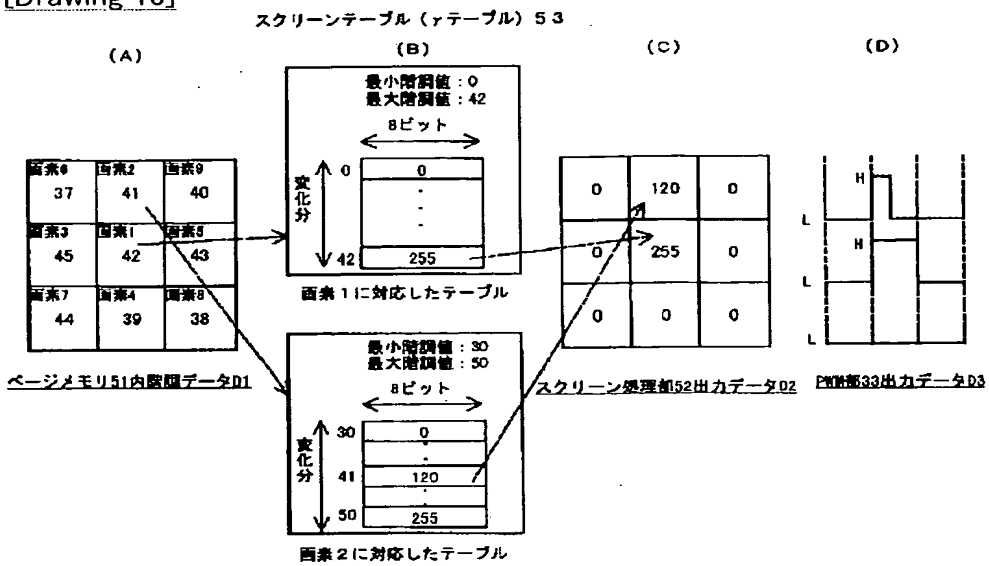


[Drawing 7]

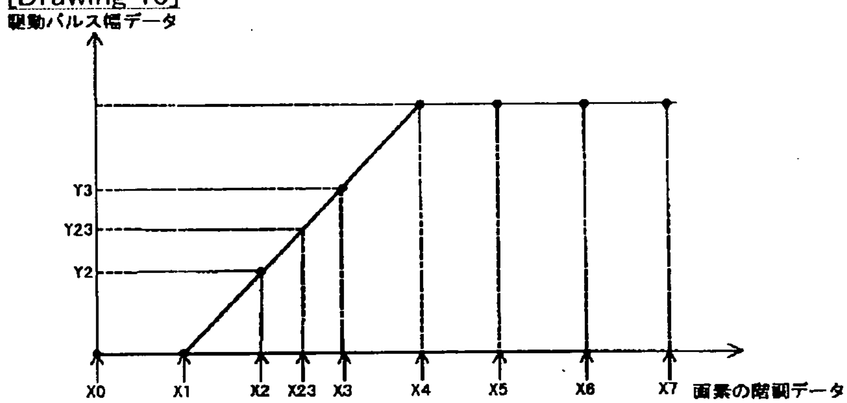
スクリーンテーブル（γテーブル）の入出力特性



[Drawing 10]

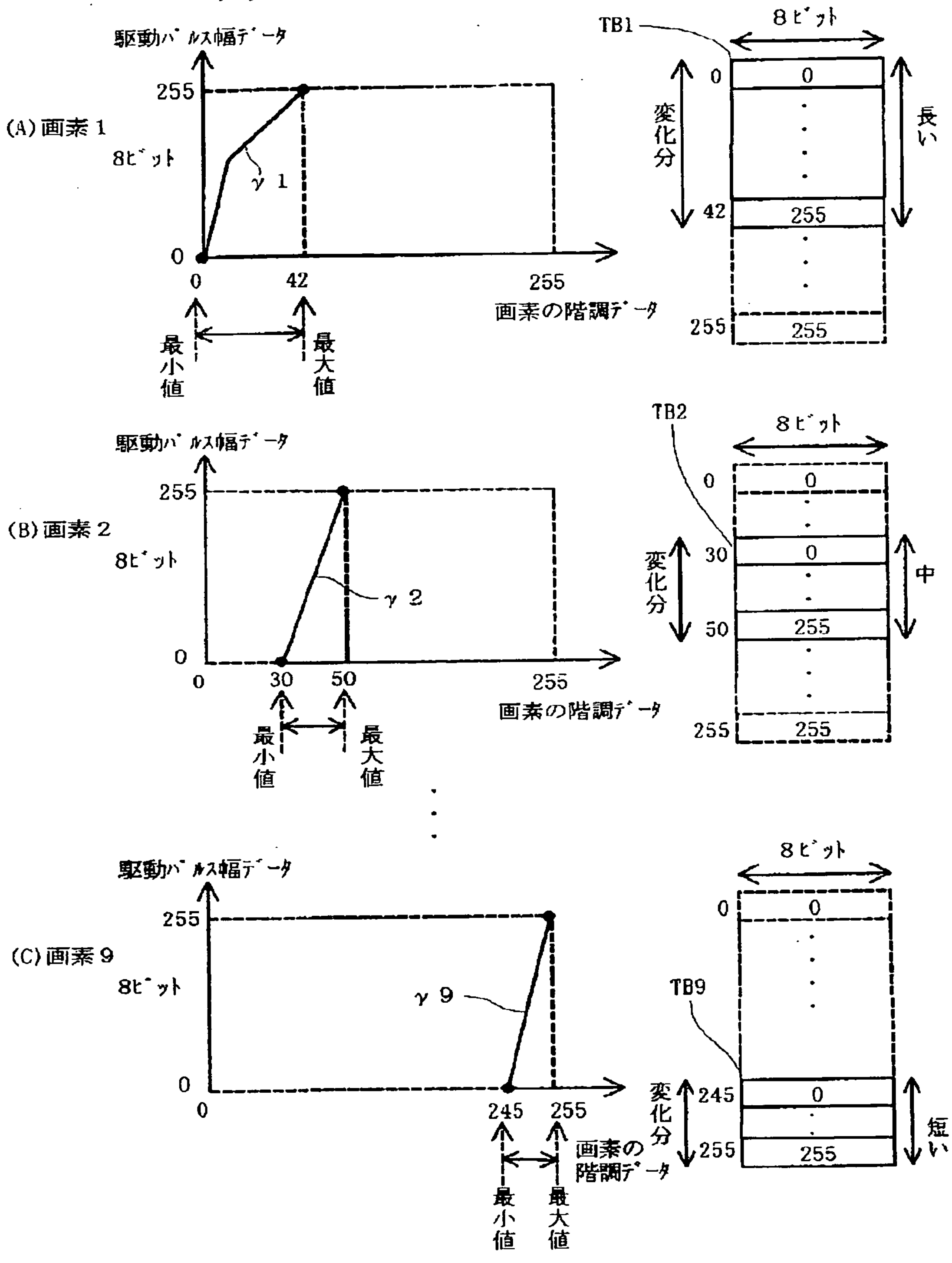


[Drawing 15]

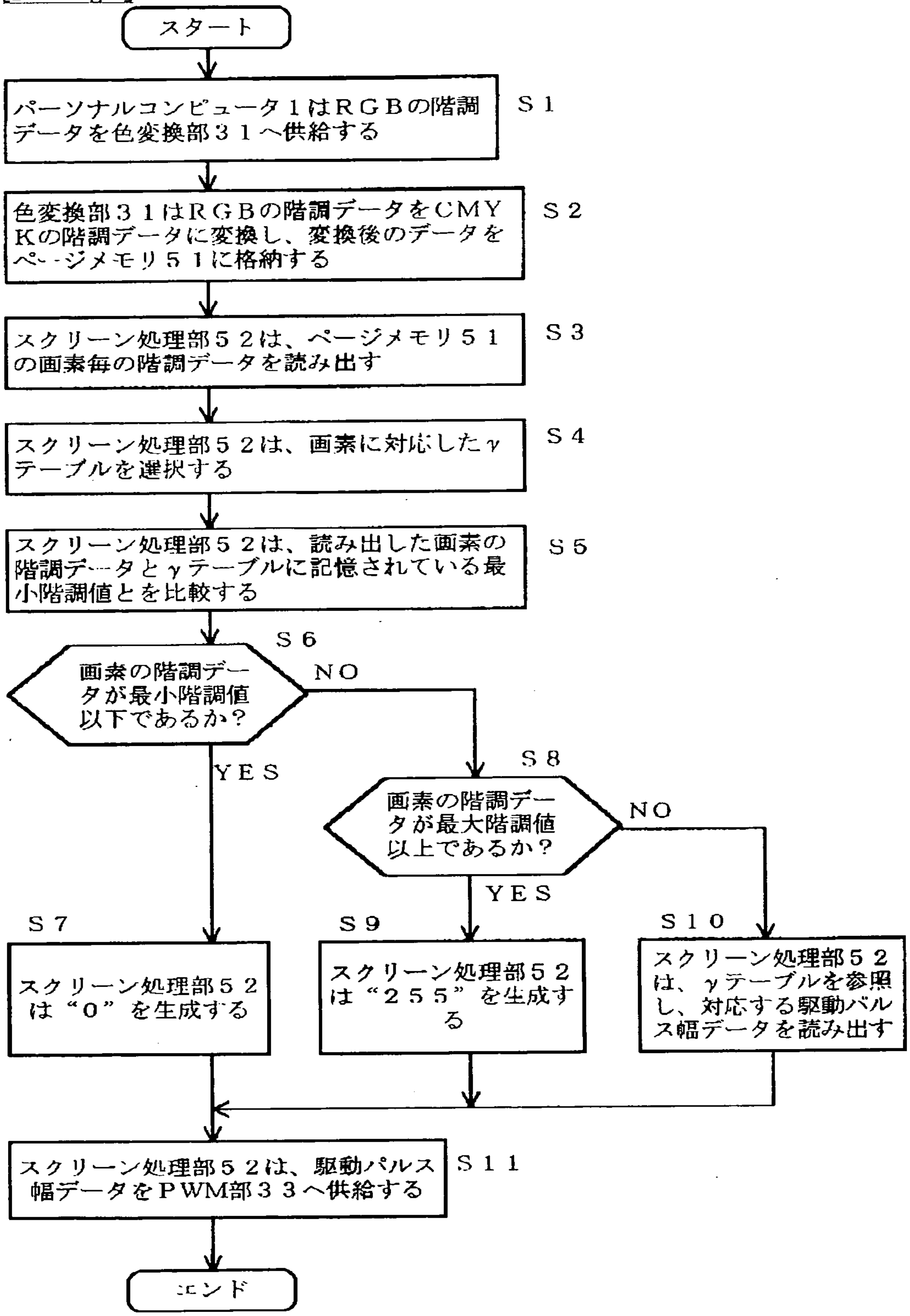


[Drawing 8]

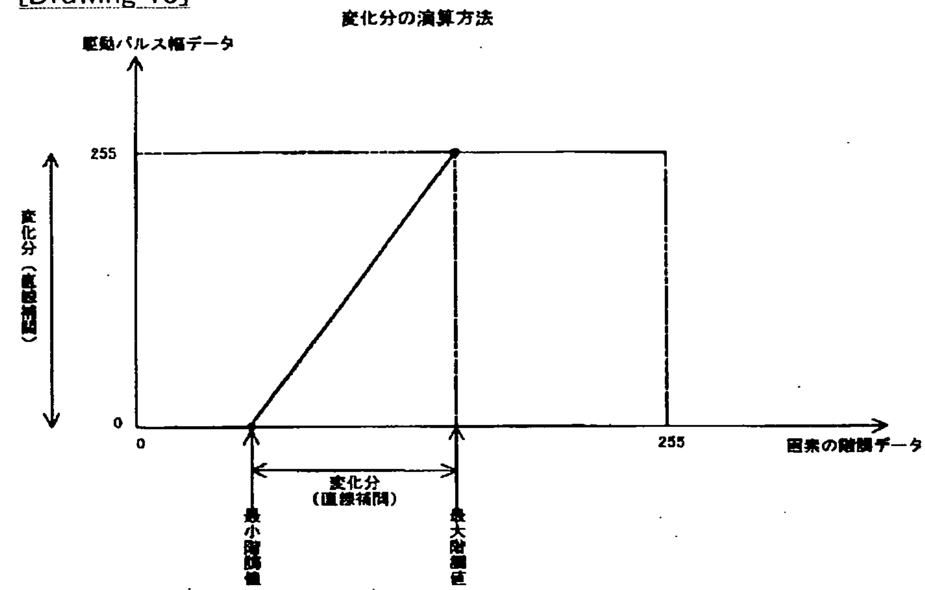
スクリーンテーブル（γテーブル）の入出力特性



[Drawing 9]


スタート
パーソナルコンピュータ１はＲＧＢの階調データを色変換部３１へ供給する
Ｓ１
色変換部３１はＲＧＢの階調データをＣＭＹＫの階調データに変換し、変換後のデータをページメモリ５１に格納する
Ｓ２
スクリーン処理部５２は、ページメモリ５１の画素毎の階調データを読み出す
Ｓ３
スクリーン処理部５２は、画素に対応したγテーブルを選択する
Ｓ４
スクリーン処理部５２は、読み出した画素の階調データとγテーブルに記憶されている最小階調値とを比較する
Ｓ５
Ｓ６
画素の階調データが最小階調値以下であるか？
ＮＯ
ＹＥＳ
Ｓ８
画素の階調データが最大階調値以上であるか？
ＮＯ
ＹＥＳ
Ｓ７
スクリーン処理部５２は“０”を生成する
Ｓ９
スクリーン処理部５２は“２５５”を生成する
Ｓ１０
スクリーン処理部５２は、γテーブルを参照し、対応する駆動パルス幅データを読み出す
スクリーン処理部５２は、駆動パルス幅データをＰＷＭ部３３へ供給する
Ｓ１１
エンド

[Drawing 13]



[Drawing 16]